and with advantage to the public. It is extraordinary how limited is the vocabulary of a large portion of even the well-educated section of the public; and it is the too free use of technical terms in the better class of popular natural histories which drives people to those of an altogether inferior description. Another point to which we would draw attention in connection with the "Coral Guide" (which, by the way, includes sponges and various other low invertebrates) is the advisability of omitting the names of describers of particular species or structures. Such names as Wyville Thompson, Hickson, Duerden and Shipley are familiar enough to zoological students, but they are quite unknown to the outside public for whom the book is intended.

A feature of the "Coral Guide" is the wealth and beauty of the illustrations, which render it a most wonderful shillingsworth, altogether apart from its high value as an excellent introduction to the groups of animals of which it treats. A number of new illustrations also characterise the seventh edition of the "Mammal Guide," which, for reasons apparent to those in the "know," the present writer is debarred from either criticising or commending. R. L.

TERRESTRIAL MAGNETISM.

AN interesting paper describing the results of an investigation to determine to what extent magnetic disturbances of the needle are connected with the geological conformation of a selected mountainous district has recently been published.[1]

The well-known inquiry into the relation between the magnetic and geological constitution of Great Britain and Ireland conducted by Rücker and Thorpe has been before us for some six years, and in the present paper we have the report of results obtained in another country and in later years having the same object in view.

The region selected for the observations was the Kaiserstuhl, a mountainous district in the neighbourhood of Freiburg in Baden, of which exact topographical and geological surveys had been made, and it is from this source that the maps accompanying the paper and upon which the results of the observations are exhibited were obtained.

The base station was at Freiburg on the spot occupied by Lamont in 1852, but the several observations were compared with a station nearly in the centre of the Kaiserstuhl, at which the magnetic elements were considered normal. In all, 382 determinations of the horizontal force, 140 of the inclination and 137 of the declination were made, and the epoch assigned is 1898·7, but no corrections for diurnal inequality were made. The resulting disturbances from these observations are shown on a special map of "Isanomalen."

The author arrives at the following conclusions:—(*a*) That wherever the geological conformation is of basalt, there he experiences disturbance of the needle partly due to permanent magnetisation of the basalt; (*b*) that the principal disturbances are caused by compact masses of basalt with a North Pole acting vertically upwards—or nearly so—on the north-seeking end of the needle, and the magnetism of these masses is not due to induction from the earth.

With (*a*) we may concur as to a connection being frequently found between the geological formation of basalt and magnetic disturbance of the needle, but it has been also shown that basalt may be present in large masses and certain forms without causing any such disturbance. The conclusion in (*b*) can hardly be accepted, for it is well known that in the northern hemisphere the north-seeking end of the needle is generally attracted downwards by locally disturbing rocks, pointing rather to induction from the earth as the cause of the magnetisation of basalt.

In order to find an explanation of the causes of the observed disturbances of the needle, pieces of basalt were taken from the surface and from a working quarry, and their several effects upon a compass observed, but no information of importance was obtained from the experiments. The question of the effects of lightning on the magnetism of rocks is also discussed, but dismissed as untenable.

It should, however, be remarked that the author does not look for more than general results from the observations as carried out, but they certainly form the nucleus of a further survey from which more definite results might be obtained as to the connection between geological conformation and magnetic disturbances.

Having considered some of the effects of local magnetic disturbance in Germany, we may now turn to the remarkable effects of such disturbance on the magnetic declination in the United States as shown in the latest chart[1] of lines of equal value of that element for 1902.

This chart is a continuation of the series published by the United States Coast and Geodetic Survey, and gives true isogonals for every degree. An examination of the lines shows that some of the most remarkable disturbances occur in mountainous districts, especially in the State of California. With its lines of equal annual change of the declination this chart is decidedly valuable, both from the practical and scientific points of view.

The values of the magnetic dip and declination given in Father Doyle's pamphlet[2] are the result of eight years' photographic record taken at the Manila Central Observatory during the period January 1, 1890, to December 31, 1897. The position of this observatory has been specially selected with a view to avoiding magnetic disturbances either in the locality or the materials of the building. Curves of the mean hourly variation of the declination for each month of the eight years are given, and also curves of the mean annual and mean semi-annual variation of the dip and declination. The chief interest, however, of the data recorded lies in the values of the secular variation of both elements for the epoch 1887-99. In these we have corroborative evidence of the small secular change of the declination, and the large change which is so marked in the dip, which has taken place during the epoch 1880–1900 at the observatories of Bombay, Batavia, Manila and Hong Kong. A chart of the isogonic and isoclinic lines corresponding to the epoch January 1892 for the region comprised between the Philippine Islands and Southern Japan is appended.

THE "NATURE-STUDY" EXHIBITION.

THROUGH the courtesy of the Royal Botanic Society, the aims of which are by no means so purely social as some of its present interests might suggest, a "Nature-Study" Exhibition is now being held in Regent's Park. Never has there been a better undertaking, nor could one be set on foot, which would do more to bring about a rational system of teaching such as is now looked forward to, whereby the pupils may be keenly interested instead of bored and their work made a labour of love instead of a dreary task.

There have long been in this country those who appre-

1 "Erdmagnetische Untersuchungung im Kaiserstuhl," von G. Meyer. (Published in the *Berichte* der Naturforschenden Gesellschaft zu Freiburg i. Br. Band xii., 1902.)

1 "Chart of Lines of Equal Magnetic Declination and Annual Change for 1902." (Published by the United States Coast and Geodetic Survey, February, 1902.)

2 "Magnetical Dip and Declination in the Philippine Islands." Brief notice of the same by Rev. John Doyle, S.J., of the Manila Central Observatory (1901).

ciate the emotional delights and the intellectual pleasures accruing from a first-hand acquaintance with nature, but the magnitude and success of the present exhibition go to show how widely and how well the value of the study which this demands is becoming recognised as a branch of all general education by those more nearly concerned with it than the naturalist.

THE OPENING CEREMONY.

In the first place, the Duke of Devonshire, who presided at the opening ceremony, which was performed by the Duchess of Devonshire on July 23, said that "the new educational departure," as he termed it, had the "very warmest sympathy" of the Board of Education, of which he is the President. In the case of rural education, he continued, the Board had met with a serious difficulty, for if the agricultural labourer does value education at all, it is only too often merely because it enables him to escape from the drudgery of his existence in the country into the more exciting atmosphere of the towns. In these circumstances it is not surprising that country gentlemen and many farmers have not viewed education and educational progress with any great enthusiasm. The Board of Education was consequently very desirous of finding some means by which education, and more especially elementary education, should be brought into closer relation with rural life and with the occupations connected with the cultivation of the land. It also felt the necessity of making all classes connected with the land feel that education is a thing which is not necessarily antagonistic to, but which ought to be conducive to, their interests.

Within the last three years, the Duke went on to say, the Board received the external assistance which they required by the formation of a very influential committee (the Agricultural Education Committee, of which Mr. Henry Hobhouse, M.P., is the secretary) of members of Parliament and county councils, which drew up certain resolutions which were formally laid before the Board of Education and accepted with much pleasure and satisfaction. The Duke of Devonshire then briefly indicated the changes in the elementary education code and in the directory for scientific education which had been made in accordance with the suggestions thus received. He alluded to the publications impressing upon the managers of schools the importance of making education in the village more consonant with the environment of the scholars, and more especially of encouraging children to gain an intelligent knowledge of the common things which surround them in the country. The lack of teachers is being met by the requirement of the Department that "nature-study" from a practical and experimental point of view shall be taken as one of the subjects for the certificate examination. The Duke also referred to the valuable assistance afforded by county councils, and gave it as the opinion of his Board that "nature-study" may with advantage be introduced into all schools, urban as well as rural. In conclusion, although the value of books as representing accumulated knowledge was ungrudgingly allowed, yet in the opinion of the Duke of Devonshire the study of them may too often be only an exercise of memory and may leave almost untouched the other faculties of the mind, while the intelligent observation and study of the facts of nature is a mental discipline which cannot fail to develop those powers of the mind which it is the object of all true education to discover, to cultivate and to strengthen.

THE EXHIBITION.

The number of the exhibits and the fact that all classes of educational establishments have contributed them is another argument in favour of the contention that the appreciation of "nature-study" as a factor in education is no longer confined to a few enthusiasts. The time has passed when one could only say what might be attempted, now one can point to this training college or to that school and say what has been done. The main object of the Association was to bring the movement to this stage and to collect together as many examples as possible of "nature-study" work or of what goes by this name. Teachers who have taken up such teaching would then be able to improve their methods after an examination of others' endeavours, while those in ignorance of how to proceed or apathetic could obtain the information they required or be spurred on to attack a subject so well worthy of attention.

In order that nothing of value might be excluded, the committee admitted anything connected with natural history teaching, and contented itself with making general suggestions as to how this might be represented at the exhibition. It must be said that the immediate results have far exceeded all anticipation. A more detailed consideration of these may be considered in connection with the chief awards that have been made, and this after a third point showing the importance attached to the "nature-study" movement has been dwelt upon. The judges whose names are given below without hesitation signified their willingness to undertake what has proved an arduous task—Profs. Hall, Miall, Lloyd Morgan, Arthur Thomson and Wallace.

In Group A the Boards of Education and Agriculture are exhibiting their leaflets, and most of the agricultural colleges are represented. Seeing how much work has been done by county councils in the training of teachers, but few of them have sent exhibits; Cheshire, Hampshire and Surrey contribute collective exhibits showing the whole educational scheme of each county, and of these Surrey has received one medal for the general exhibit and another for the individual work exhibited by Tiffin's Boys' School Natural History Society properly coming into Group B (secondary schools). A large number of the latter schools of all grades have sent exhibits. Medals have been awarded to the High School, Arbroath, for drawings illustrating natural history; to St. Paul's School, for the work of the School Field Club; to Streatham High School, of the Church School Company, for a nature-study calendar; to James Allen's Girls' School, Dulwich, for the general exhibit, which contains many interesting water cultures of plants; to Bedale's School, Hants, for its scheme of nature-study; and to the Friends' School at Bootham, York, for its general exhibit, which was chiefly that of the Boys' Natural History Society.

Among the numerous elementary schools, the Chislehurst Road Board School, Orpington, Kent, received a medal for its general exhibit, as did the Arnot Street Board School, Liverpool, for its excursion scheme. The only training college similarly recognised was the House of Education, Ambleside, while among the exhibits of private persons and institutions a medal was given to the Stepney Borough Museum. Two American exhibits, namely, those of the New York Natural History Museum and Philadelphia Training College, also received the highest possible award.

A most important result which will possibly accrue from the exhibition will be the determination of what kind of nature-study teaching is to be recognised as such; for this one must look to the report of the Association after receiving the collective and individual expressions of opinion from the judges. Looking, however, at the exhibits which have received medals, it will be seen that they have in nearly all cases shown evidences of outdoor work or practical dealing with living things upon the part of pupils themselves. The fourth piece of evidence as to the value of the exhibition as promoting nature-study is afforded by the position and standing of

those who have taken part in the conferences or have promised to do so. A short account of some of the addresses and papers is given below.

THE CONFERENCES.

Mr. Hanbury, President of the Board of Agriculture, presided at the first of the meetings on July 24 and spoke of the general educational value of nature-study and of the special dependence of agricultural industry upon habits of careful observation. He further pointed out how his Board and that of Education were working in harmony together, and said with regard to those agricultural colleges which have been undertaking the training of teachers that their work ought to be recognised by the bestowal of extra grants by the Board of Agriculture.

Lord Avebury took as the subject of the first address "The Study of Nature." He attributed a most curious ignorance of common things to the fact that great public schools omit the subject altogether, or devote to it only an hour or two in the week snatched from the insatiable demands of Latin and Greek. Oxford and Cambridge have most excellent science schools, but prizes and fellowships are still mainly given to classics and mathematics; degrees are given there, and now, alas! even at the University of London, without requiring any knowledge of the world in which we live. Our universities give excellent teaching, they prepare learned specialists, but are places of instruction rather than of education. Lord Avebury touched also on early specialisation; on the use and abuse of collections; and the various lines along which nature may be studied.

Mr. Henry Hobhouse, M.P., read a paper on "How County Councils may encourage Nature-Study." Their chief work, he said, lies in the direction of training teachers, and this training, though not necessarily a thoroughly scientific one, should impart the elements of certain sciences, and more particularly a knowledge of the best methods of inculcating habits of observation. Mr. Hobhouse summarised what the county councils had already done, and said that much more still remained to be accomplished. As it was not to be expected that every village schoolmistress would be able to teach nature-study, an arrangement would have to be made for peripatetic teachers to visit groups of small schools: school gardens and school museums would also have to be organised. Useful work in the protection of wild birds might be done by holding classes to which gamekeepers might be specially asked to attend, and much economic nature-study could be taken up.

Prof. Geddes was unable to be present, and his paper was taken as read; its vital points are (1) that nature is a moving unity or pageant of the seasons, not an abstract syllabus of "object lessons" or even dissected "types"; (2) that the essential strategic point for the nature teacher is to give the pupil the joy of nature before the intellectual analysis of it; (3) among immediate practical possibilities, and taking excursions for granted, the essential desideratum to be secured for country and suburban schools without delay and for town schools so far as possible is the school garden, always provided this is designed to show to the full, the living seasonal beauty of its chosen plants and be not a cats' graveyard of labels, however orderly. The introduction of a flower border, however small, into the present desert playground is pleaded for on all grounds, moral as well as intellectual and æsthetic.

Prof. J. Arthur Thomson began his most interesting and suggestive paper by quoting the definition of nature-study given by his friend Prof. Geddes, it is "the habit of observing and thinking for oneself and at one's best, without books or helps, in the presence of the facts and in the open air." Prof. Thomson had next a word to say on the danger of doing nature-study teaching badly and distorting the child's outlook on the world. Given a man or woman with the mood of the naturalist, the country schoolmaster who knows and loves the birds, or the country schoolmistress who knows and loves the flowers, then the course of nature-study—now compulsory—is sure to be healthful. Given, however, a teacher who, through overwork, or preoccupation with other disciplines, or lack of early training, is only coercively, not organically, interested in nature-lore, then Prof. Thomson feared that the result would be very bad indeed. The title of the paper was the "Seasonal Study of Natural History," and a sketch of a seasonal course was given, arranged so that the scholars faced appropriate problems at appropriate times. It was argued that the seasonal order and method of study, though not the easiest, was the most natural. It was the most primitive method, yet the exhibits seemed to show that it was capable of being the most evolved. It followed up the pre-school education of the child, and was justified by physiological and psychological facts. Furthermore, the seasonal method worked exceedingly well in practice, being always relevant to what the pupils are seeing and feeling out of school, facilitating the desirable cooperation of the class in securing the specimens for the actual work, and being readily correlated with other school studies.

Mr. H. Coates illustrated the subject of local museums as aids in the teaching of nature with reference to Perth Museum, in connection with which children's essay competitions are most successfully held.

Lord Strathcona, as chairman at the second conference on July 28, gave an account of work in Canada carried out by the generosity of Sir William McDonald, who has given three-quarters of a million of money. Model farms were touched upon, and Lord Strathcona gave a particularly interesting account of his own work in introducing vegetable culture into Labrador, which had previously been unknown.

Prof. Lloyd Morgan had also a definition to give when dealing with nature-study in elementary education. He said that it was "a means by which simple natural objects and processes acquire *meaning*." Like Prof. Thomson's paper, the whole question is so carefully considered that no brief notice could do it justice. The movement which the meeting was to foster and develop, according to the speaker, is part of that reform of educational procedure which has been in progress for many years. One of the points to be regarded is the patchiness of a child's mind, to whom even the beginnings of science are impossible. The teacher, say a scientific botanist, must not, therefore, get tired of fostering the powers of observation and affording facilities for simple investigation, and instead endeavour to inculcate general laws and principles beyond the comprehension of the child. Technical terms where they are simple nouns and not descriptions are allowable, but after reading a long description of the dandelion taken from a nature-study book Prof. Morgan begged his hearers to stop before they got to "anthers syngenesious."

Mr. Franklin dealt with how to bring children into touch with nature, and the work of the Leicester School Board was described by Mr. Major. Miss Mary Simpson, in speaking of the teacher as an observer, suggested that if the teacher had reached that stage most of the difficulties would be gone. Finally, at this meeting, which during the latter half was presided over by Sir Joshua Fitch, Mr. John Evans urged the advantages of using trees as a means of nature-study.

On Tuesday, July 29, the chair was taken by the Lord Balfour of Burleigh, K.T., Secretary for Scotland. He gave an account of the excellent progress of the "nature-study" movement started several years ago across the border. "Nature-study," he said, must be rather looked upon by the children as recreation; their minds must not be filled with facts, but must be taught to make observations and to investigate. If this were done it would redound to the credit of education in all countries.

Mr. Choate, the American Ambassador, in introducing Prof. Albert Bickmore, of the Natural History Museum, New York, added the weight of his testimony to the value of the work in hand. After this Prof. Bickmore briefly explained his methods of visual instruction, at first geographical and now combined with nature-study; and after the conference in the club-room the audience adjourned to the museum in the gardens to see a series of views thrown upon the screen with the lantern to illustrate further Prof. Bickmore's methods, with children, older scholars, university students and teachers. He began his work with a class of 28, and last winter the attendance at his lectures was 26,910.

Mr. Herbert Morrell, M.P., brought forward many trenchant and amusing examples of the value of "Nature-Study in relation to Rural Pursuits."

Prof. Hall, of Wye College, in defining the "Proper Attitude of the Teacher," had some excellent points to lay before his hearers. He appeared, however, to think, contrary to others interested in the subject, that "facts" must be accompanied by "ideas," which brings it near to elementary science teaching. The subject taken from the standpoint of a teacher in an elementary school and considered in a paper by Mr. G. H.

Rose, headmaster of Caterham Board School, has much in it that others less nearly connected with the work might fail to recognise, and will prove well worthy of careful examination when it is printed.

The remainder of the programme is as follows :—

Thursday, July 31, chairman, Sir George Kekewich, K.C.B., Secretary to the Board of Education. Address on "Nature-Study in Colleges and Higher Schools," by Prof. Miall, F.R.S. Selected speakers :—"Nature-Study in Girls' Secondary Schools," Miss Mary Gurney ; "Plant Life as Nature-Study," Mr. Scott Elliott ; "School Gardens," Mr. T. G. Rooper; "Geology as a Branch of Nature-Study," Prof. Grenville Cole.

Friday, August 1, chairman, the Right Hon. Sir W. Hart-Dyke, Bart., M.P. Address on "The Training of Teachers in Nature-Study," by the Rev. Canon Steward. Selected speakers :—"The Relation of Nature-Study to School Work and to the Home," Sir Joshua Fitch ; "Nature-Study as an Element of Culture," Mr. M. E. Sadler ; "School Rambles and the Training of Teachers," Mr. J. H. Cowham ; "The Present Work of the County Councils," Mr. H. Macan.

In conclusion, it must be said that the work of bringing the undertaking to such a successful issue has taken the whole time and energy of Mr. J. C. Medd, the honorary secretary, who has had at his disposal the great experience and the marvellous tact of Sir John Cockburn, the chairman of the Association ; Mr. Cundall, of the Victoria and Albert Museum, Mr. A. T. Simmons and Mr. A. Taylor, H.M. sub-inspector, to whom the task of arranging the exhibits was allotted, must also be given a full measure of praise. WILFRED MARK WEBB.

NOTES.

THE members of the new Order of Merit were entertained at dinner by the Athenæum Club on Friday last. Science was represented by four of the twelve members of the Order—Lord Rayleigh, Lord Kelvin, Lord Lister and Sir William Huggins. Lord Avebury (trustee of the club) presided, and among other members present were many leaders of science, art and literature.

A NEW laboratory for the study of experimental psychology has been instituted at King's College, London. The laboratory will be in charge of Dr. W. G. Smith, under Prof. Halliburton's general supervision.

THE *Times* states that during her passage from Kronstadt to Kiel the Italian cruiser *Carlo Alberto* carried out some important experiments in wireless telegraphy under the personal direction of Mr. Marconi. Signals were exchanged with stations 2000 kilometres distant, 1000 kilometres by sea and 1000 kilometres by land.

PROF. F. A. FOREL writes from Morges to say that he has made inquiries into the report that after a shower of rain at Frauenfeld, Canton Thurgau, Switzerland, the ground was covered with a thin layer of ashes of greyish-blue colour (p. 306). A teacher of natural history at Frauenfeld has informed him that the news was misleading and that the dust was not of volcanic origin.

A TELEGRAM from Kingstown, St. Vincent, states that there have been two slight eruptions of the Soufrière volcano since July 21, and an earthquake in the north-eastern part of the island. The cable steamer *Newington*, which is working eighteen miles to the north, reports that the depth of the sea has increased in that locality to a mile and a quarter.

THE *Daily Mail* correspondent at Madrid reports that two large cliffs near the town of Calataynd, in Aragon, have fallen down, destroying several houses and injuring many people. A crater has opened in the Pico de Europa mountains, which separate the provinces of Santander and Asturias. A great column of vapour is issuing therefrom, and the people are in a state of alarm, fearing a volcanic eruption. A Central News despatch from the Azores states that there has just been a terrific submarine volcanic eruption off Horta. Masses of rock in a state of incandescence were thrown up, and the people became panic-stricken. A Reuter despatch from San José, Costa Rica, states that there has lately been unusual activity among the Costa Rican volcanoes, considerably affecting the land in the neighbourhood of Terraba. From New York another Reuter despatch records that an earthquake shock was felt shortly after midday on Monday, July 28, in parts of Nebraska, Iowa and South Dakota, but no damage was done. Three shocks have also occurred in the Lompoc Valley, California, since Sunday evening, July 27. Cracks appeared in the earth and there was widespread panic among the inhabitants. Vibrations have also been felt at other places in California.

THE *Westminster Gazette* on Saturday last devoted a column and a half to the Armstrong-Orling system of wireless telegraphy. We have referred on two or three occasions to this system, the receiving apparatus of which was described in these columns last December. We now understand that a company is about to be registered to manufacture and supply the transmitters and receivers. It is stated that apparatus has been worked out suitable for wireless signalling up to a distance of twenty miles, the ground being used as a conductor, and that it will be sold, at a very cheap rate, for private installations. Details of a technical nature are, however, entirely wanting, and without these it is impossible to form any opinion of the system. So far as we know no description of the transmitter has been published, although we were told eight months ago that it was proposed to read a paper upon it before one of the scientific societies. We have also consulted the patent files, but there is nothing in Mr. Orling's name as yet printed which is specially novel or remarkable. It is therefore advisable to wait until further particulars are available before deciding whether the "programme of amazing promise" sketched in the *Westminster Gazette* is likely to be realised.

WE regret to see the announcement of the death of the Rev. Charles E. Searle, master of Pembroke College, Cambridge, and formerly college lecturer in mathematics.

IN the House of Commons on Monday, Mr. J. A. Dewar asked whether it could be made a condition of the annual grant of 15,300*l.* to the Meteorological Council that the high-level and low-level observatories at Fort William should be kept in a state of efficiency, or whether an additional contribution towards the expenses of properly maintaining these observatories would be considered. In reply, Mr. Balfour said he had been advised it would not be desirable to impose conditions on the Meteorological Council or to inquire into this or that particular observatory. He was not prepared to give an answer to the last part of the question.

THE decision to close the observatory on Ben Nevis was discussed at the general meeting of the Scottish Meteorological Society, held in Edinburgh last week. Lord Maclaren, who presided, said that the observatory would have to be closed because there were no funds available for carrying on the work. He thought it was a case for inquiry, and if the Government appointed a committee to take evidence, probably the difficulties would be overcome. Sir John Murray, as one of the original directors, said it was not their intention to found a permanent institution, but only to make an experiment of high-level observations. The experiment had been most satisfactory in every respect. But the observatory must now be closed unless one of two things happened ; either the State must take over